

Pit by Iken Church.

Ditto half a mile south-west of Calton farm.

Brick-kiln one mile north-north-west of Aldbro'.

N.B. Coralline Crag has also been found in digging at Trimley (authority of the late Mr. Acton).

XXI.—*On the Occurrence of Amœbiform Protoplasm, and the Emission of Pseudopodia, among the Hydroida.* By Professor ALLMAN, F.R.S.

[Plate XIV.]

ONE of the most striking peculiarities of the hydroids which compose the family of the *Plumulariadae* is the occurrence among all of them of certain singular bodies which are produced as buds at definite spots upon the hydrosoma. These bodies have been examined by Huxley* and also by Busk, who, from the fact of their often containing clusters of large thread-cells, has named them "nematophores" †.

The most important character, however, of the nematophores has hitherto escaped notice; and yet it is one full of interest, involving as it does the manifestation of phenomena whose existence among the *Hydroida* has not as yet been suspected.

The species which I have had an opportunity of most thoroughly examining are *Aglaophænia pluma* (*Plumularia cristata* of most authors) and *Antennularia antennina*; and I shall confine the present paper to a description of the nematophores and their contents in these two hydroids.

1. *Aglaophænia pluma*.

In *Aglaophænia pluma* there are two sets of nematophores—a mesial and a lateral (Pl. XIV. figs. 1–4). The mesial nematophores (*a a*) are situated exactly in the mesial line, one being placed in front of every hydrotheca. These mesial nematophores consist each of a chitinous tube with peculiar contents. The tube springs from the base of the hydrotheca, and, thence continuing for the greater part of its length adnate to the front of the hydrotheca, terminates in a free tubular spine-like process a little below the orifice of the latter. It opens below into the common tube of the chitinous periderm; and just before its termination its cavity communicates by a lateral orifice with that of the hydrotheca, while its free end opens externally by a very oblique aperture.

* Huxley, "On the Anatomy and Affinities of the Medusæ," Phil. Trans. 1849, p. 427.

† Busk, Hunterian Lectures (MS.), delivered at the Royal College of Surgeons, London, 1857.

The lateral nematophores (*b*) consist, like the mesial ones, of tubular processes from the chitinous periderm, and of peculiar contents; but while the mesial nematophores are formed by a set of azygous appendages, the lateral ones are, on the other hand, arranged in pairs, each pair consisting of two processes, which are given off, exactly opposite to one another, from the sides of the branch, nearly on a level with the orifice of every hydrotheca. The chitinous tubes communicate at their base with the cavity of the tubular periderm of the branch, and open by an oblique aperture at their free extremity.

The contents of the nematophores consist, in both cases, of a soft granular mass, which is continuous below with the ectoderm of the cœnosarc, and, just behind the terminal aperture, ends in a bulbous extremity (*c*), in which is immersed a cluster of large fusiform thread-cells.

In those nematophores which lie along the mesial line, the tubular sheath is furnished, as has just been said, not only with a terminal aperture, but also with a lateral one, through which its cavity communicates with that of the hydrotheca. Through this aperture the soft granular mass which fills the tube of the nematophore has the power of emitting very extensile and mutable processes, which project into the cavity of the hydrotheca. These processes (*d'*) consist of a finely granular substance, which undergoes perpetual change of form, being at one time broad lobe-like extensions, at another longer and more cylindrical, sometimes more or less clavate, occasionally irregularly branched; while, again, they can be entirely withdrawn (*d*), so as to leave no apparent trace of their existence. In short, they comport themselves in every respect exactly like the "pseudopodia" of an *Amœba*, which they also resemble in their structure; for they consist of a simple protoplasm composed of a transparent semi-fluid basis, in which minute corpuscles are suspended.

Those nematophores which, instead of being situated on the mesial line, are arranged along each side of the branch, have their contents quite similar to the others, and send out from their terminal aperture similar pseudopodial processes (*e*), which are then projected freely into the surrounding water. I have never witnessed the emission of pseudopodia from the terminal apertures of the mesial nematophores. In no case do the thread-cells appear to be carried out in the pseudopodia.

It would thus seem that the contents of the nematophores in *Aglaphœnia pluma* consist of a true sarcode or protoplasm; and, except in the fact that this protoplasm contains a cluster of thread-cells immersed in its substance, it appears in no respect to differ from that which constitutes the substance of an *Amœba*.

2. *Antennularia antennina*.

In *Antennularia*, a genus possessing the closest affinities with *Plumularia*, phenomena entirely similar to those just described in *Aglaophænia* may be witnessed.

In *Antennularia antennina* (Pl. XIV. fig. 5), a pair of conical cup-shaped nematophores (*b*) spring from the hydrosoma on a level with the mouth of every hydrotheca; while between every two hydrothecæ there also occur three similar, but azygous, nematophores (*a*), which are arranged mesially along the front of the ramulus. The nematophores of *Antennularia* differ from those of *Aglaophænia* in the fact of their being each attached to the hydrosoma only by their narrow extremity, while from this point they are free for their entire length. They terminate at their distal or wide extremity in a hemispherical cup-like depression, whose bottom is formed by a chitinous membrane constituting a diaphragm which separates the cavity of the cup from that of the rest of the nematophore. This diaphragm, however, is perforated by a circular aperture in its centre. The nematophore is thus bi-thalamic, consisting of two chambers—a proximal deeper and narrower one, and a distal wider and shallower one, the two freely communicating through the perforation in the dividing diaphragm.

The whole nematophore is filled with a granular protoplasm, which is continued from one chamber into the other through the perforated diaphragm. In the distal chamber, it forms, when in a state of repose, a little spherical mass (*d*); but there does not occur in the nematophores of *Antennularia* any special accumulation of large thread-cells, as in those of *Aglaophænia pluma*, and only a few minute thread-cells may be seen scattered through the protoplasm.

When a living branch of *Antennularia antennina* is examined in a trough of sea-water under the microscope, the mass of protoplasm which occupies the distal chamber may be seen, in both sets of nematophores, to slowly elongate itself into a variously shaped process (*d'*, *e*), exactly like the pseudopodium of an *Amœba*. When this process meets the external surface of the ramulus, it frequently runs in contact with it for some distance, and, while we continue to look, the whole will be again slowly withdrawn, until it once more assumes the form of a spherical mass filling the cup-like distal chamber of the nematophore. The pseudopodial processes of the nematophores in *Antennularia antennina* are usually simple; in one instance only did I witness what seemed to be a short irregular branch given off from the finger-like pseudopodium.

EXPLANATION OF PLATE XIV.

Figs. 1-4. Hydrotheca with polypite and neighbouring parts in *Aglaophænia*

pluma. Fig. 1 exhibits the polypite exerted from the hydrotheca, and the pseudopodia withdrawn: *a a*, mesial nematophore; *b*, lateral nematophore; *c*, bulbous termination of the protoplasmic contents of mesial nematophore, with a cluster of large thread-cells immersed in the protoplasm; *d*, point at which the protoplasm of the mesial nematophore may be projected in the form of a pseudopodium through the lateral aperture of the nematophore into the cavity of the hydrotheca. The figure represents the condition in which the pseudopodial process is entirely withdrawn.

Figs. 2-4. Polypite retracted and the pseudopodia in various states of emission: *d'*, pseudopodia projected into the cavity of the hydrotheca through the lateral aperture in the mesial nematophore. In fig. 4, the pseudopodium has become irregularly branched: *e*, pseudopodia projected into the surrounding water from the summit of the lateral nematophore.

Fig. 5. Portion of a ramulus of *Antennularia antennina* with hydrotheca and exerted polypite, and nematophores: *a*, azygous or mesial nematophores; *b*, lateral nematophores in pairs; *d*, protoplasm in a state of repose, forming a spherical mass in the distal chamber of the nematophore; *d'*, protoplasm of the azygous nematophores extended as a digitiform pseudopodium; *e*, similar extension of the protoplasm of the lateral nematophores.

XXII.—On the Species of *Neæra* found in the Seas of Japan.

By ARTHUR ADAMS, F.L.S. &c.

THE species of *Neæra*, properly so called, are less numerous than is commonly imagined. Many shells formerly regarded as belonging to this genus have already been distributed among other tribes. For example, *N. viridescens*, Hinds, *N. opalina*, Hds., and *N. lata*, Hds., have been properly referred to *Theora*, a genus which I consider should be placed in Tellinidæ, in close proximity to *Abra* or *Syndosmya*. Then, again, *N. lyrata*, Hds., *N. tenuis*, Hds., and *N. pulchella*, Ad. & Rve., have been removed to *Raëta*, a genus of Mactridæ; and now I shall endeavour to show, by an examination of the hinge-teeth and by other characters, that *N. cochlearis*, Hds., and *N. adunca*, Gould, constitute two small groups in the immediate vicinity of *Scrobicularia*.

The genus even then, when properly restricted, will exhibit forms so dissimilar, or dentition so peculiar, as to require to be thrown into three distinct groups.

Genus NEÆRA, Gray.

Shell inequivalve. Surface of valves lamellar. Hinge with a prominent cup-like cartilage-pit. Right valve with a posterior lateral tooth.

1. *Neæra elegans*, Hinds.

N. elegans, Hds. Proc. Zool. Soc. 1843, p. 76.

N. Molluccana, Ad. & Rve. Moll. Voy. Sam. pl. 23. f. 4.

Hab. Mino-Sima; 63 fathoms.